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Limits to sentience

Commentary on [Segundo-Ortin & Calvo](#) on *Plant Sentience*

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Abstract: There are many parallels between cellular function in animals and plants. Plants can have complex interactions with their environments. But they lack a central nervous system, which is a prerequisite for sentience (the capacity to feel). In my view the suggestion that plants are sentient is not only empirically incorrect but potentially harmful to the efforts to protect the welfare of sentient beings.

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1. Sentience in law. The use of the term sentience in law, as well as in science and philosophy, has already had beneficial effects for those animals that are sentient. The European Union has referred to the animals used by humans as sentient beings since the Treaty of Amsterdam (European Communities 1997) and has taken account this into account to some extent in making policies and laws (Broom 2017). The Animal Welfare Act in New Zealand (1999) has detail about the use in law of the term sentience and other countries have followed their lead. However, the benefits of the concept of sentience would be eroded if it were used for too wide a range of organisms. While the proposal by Segundo-Ortin & Calvo (2023) (S&C) usefully draws attention to responses by plant cells to external events, like many other commentators, I consider the suggestion that plants might be regarded as sentient to be scientifically incorrect and potentially harmful to sentient beings. The harm could ensue if the whole concept of sentience were undermined by a view that much of what is living is sentient.

2. Animals and plants. As Harnad (2023) points out, it is important in a discussion such as this to clarify the meanings of concepts. The concept of “one biology,” like those of “one health” and “one welfare” (Tarazona et al, 2020, Broom 2022a) emphasises that biological processes in human and non-human animals are the same, just as the concepts of health and welfare mean the same in humans and all other animals. An animal is a living being with a nervous system and other complex mechanisms for obtaining energy, using energy, and reproducing. Animals derive energy by consuming other organisms and most have an effective means of locomotion and a range of sense organs. Plants have a major advantage over animals because of their ability to obtain energy but, as explained further below, only animals have a true nervous system.

3. Sentience. As individual humans and other complex animals develop, there is a stage when they become aware of aspects of themselves (DeGrazia, 1996) and of their interactions with their environment. They become sentient. There is a consensus among most scientists who write about sentience that sentience means having the capacity to have feelings (Kirkwood 2006, Broom 2014, 2016, 2022 a, b). This capacity includes having the awareness and, in many situations, the cognitive ability necessary to have feelings. As explained by Broom (2007, 2014), a sentient being is one that, in order to have feelings, has some ability: to evaluate the actions of others in relation to itself and third parties, to remember some of its own actions and their consequences, to assess risks and benefits and to have some degree of awareness. Feelings are important coping mechanisms in those animals that have them and are a key component of welfare, as are other adaptive coping responses, including mechanisms for coping with pathology. In a discussion of the evolution of feelings Broom (1998) defined a feeling as a brain construct involving at least perceptual awareness which is associated with a life regulating system, is recognisable by the individual when it recurs and may change behaviour or act as a reinforcer in learning. Emotions are similar to feelings but physiologically describable (Broom, 2014). While some early uses of sentience, and indeed feeling, sometimes referred only to having sensory function and, in particular a sense of touch, this usage is now superseded by the meanings explained above.

4. The arguments about plants. S&C's initial statement about sentience refers to "felt states, including sensory experiences, external or internal". However, a nervous system with some degree of brain development is required in order to have an experience and no plant has this. A second statement by S&C suggests that mental states of non-human individuals cannot be investigated. Thousands of scientific papers contradict this. As the assumption that human reports about their mental state are accurate is very often incorrect so, according to the view of S&C, it would seem that no certain evidence about the mental state of any animal, including any human, can ever exist.

The very interesting studies showing that plants can respond to their environment by detecting and adapting (Struik 2023) do not provide evidence that they have cognitive ability. If the information about their environment used by plant cells comes from other plants, this does not mean that either plant has the capacity to have feelings. Neither is it true that changes in responses following reception of different kinds of stimulation, even if some degree of apparent mimicry of other living organisms occurs, involve complex awareness or cognition. (See the discussions of levels of awareness by Sommerville & Broom 1998 and of the complexity of cognitive ability by Shettleworth 2009). The suggestion that collections of plant cells forming a plant organism have nervous function comparable with that of social groups of animals like swarms, flocks or shoals has insufficient scientific basis, and indeed, all so-called "swarm intelligence" can be explained by response of individuals to one another and to other aspects of their environment.

5. Conclusions. There are many parallels between processes in plant cells and animal cells. Plants can sometimes influence their environment in complex ways. But none of the examples of such influence indicate that there is a nervous system in any plant. Not only is it clear that plants do not have a central nervous system but, as Pessoa (2023) points out, there is also no evidence of a "functional centralisation" of responsive components in plant cells. In the absence of a nervous system, plants cannot be sentient. Animals, including humans, have a

wide range of methods of coping with their environment, many of them depending on brain and other nervous system action, so we can refer to the welfare of any animal but not to the welfare of plants (Broom 2022 a, b).

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